METHOD AND APPARATUS FOR ROUTING A SERVICE REQUEST

FIELD OF THE INVENTION

[0001] The present invention relates to telecommunications systems and, more precisely, to the methods for the routing of service requests in said systems and to the apparatuses involved therein.

BACKGROUND

[0002] A state-of-the-art telecommunication system can comprise various functional entities, also known as telecommunication nodes, arranged to serve communication and services to a plurality of user terminals utilized by the users of said system. Depending on the specific characteristics of a concrete telecommunication system, it can comprise various kind of telecommunication nodes, each performing one or a set of specialized functions; wherein, depending on implementation details, each node can be implemented within a single physical machine, or be distributed across various physical machines, each implementing a part of the total functionality required and/or standardized for said node. The term "server entity" shall be used hereinafter in this application to refer to a node in a telecommunication system which performs a specific functionality, regardless if it is implemented within one physical machine or various cooperating physical machines.

[0003] Among other server entities, a telecommunication system can comprise one or a plurality of interconnected *communication server entities* (CS), which are entitled to intervene in the signaling related to the provision of

communications between user terminals (e.g.: voice calls, data calls, etc.), as well as in the signaling related to the provision of services to said user terminals (e.g.: usage of messaging services); wherein the provision of a

5   communication between two user terminals, as well as the provision of a service to a user terminal, can require the intervention of one or more server entities in said telecommunications system. Examples of communication server entities CS are: switching/routing nodes such as MSCs

10   (Mobile Switching Centres), SGSNs (Serving GPRS Support Nodes) or GGSNs (Serving GPRS Support Nodes) in a mobile system; Proxy Servers in a SIP-based system (e.g.: as described in "*SIP: Session Initiation Protocol*" IETF-RFC3261); CSCFs (Call State Control Functions) in the IMS

15   (IP Multimedia Subsystem) of a 3rd. generation mobile system (e.g.: as described in the stage-2 of the IMS, specification TS 23.228 V5.5.0, Jun-2002); etc.

[0004] For the purpose of identifying individually each one of the plurality of users on a telecommunication

20   system, and/or their corresponding user terminals, users of a telecommunications system are assigned to identifiers (hereinafter: user identifiers, user-IDs). The types of user-IDs, and even the number of user-IDs per user, can vary depending on the characteristics of a

25   telecommunications system. For example, nowadays a user can be assigned to one or more user-IDs of various types such as: a E.164 number (also called "*telephone number*"), an "URI" (Uniform Resource Identifier), an "*h323-ID*", etc.

[0005] User-IDs are primarily used to identify a

30   counterpart user in a communication. Thus, when a given user "A" establishes a voice call or a data call with another user "B", a communication request is sent which

conveys the user-ID of the user "B", and which will be used
to route said communication requests towards a terminal of
user "B". Said communication request can traverse one or
more communication server entities (CSs) depending, for
5   example, on if both users, "A" and "B", are served from the
same or different CSs. According to the signaling protocol
utilized, a communication request can be conveyed in
various signaling messages. For example, a communication
request can be conveyed within an IAM (Initial Address
10 Message) message according to ISUP (ISDN User Part), an
INVITE message according to SIP, a SETUP message according
to H.323, etc; wherein the communication request contains a
user-ID of the destination user in a format appropriate to
the signaling protocol utilized for signaling the
15 communication request (e.g.: ISUP, SIP, H.323, etc.).

[0006] Similarly, some services provided by a state-of-
the-art telecommunications system can also be assigned to
individual identifiers (hereinafter: service identifiers,
service-IDs, SIDs). Service-IDs can have the same format as
20 cited above for user-IDs, thus, not only easing its usage
by end users, but allowing to use the same routing
mechanisms in the telecommunications system for service-IDs
as for user-IDs.

[0007] Accordingly, the access to a specific service,
25 identified by a specific service-ID, can be achieved by
sending a service request containing said service-ID;
wherein, service requests can also be signaled according to
any of the signaling protocols mentioned above which are
used to convey communication requests between users.

30 [0008] However, as opposed to a user-ID, which identifies
a user (or a terminal assigned to a user), a service-ID
identifies a specific service in a server entity

(hereinafter referred as *application server entity*, AS) which hosts said service, or, in other words, which hosts service logic to accomplish said service and to process a service request related to it. Also, as will be understood
5 with some service examples given below, service-IDs trend to have a more temporary nature than user-IDs, as they can be created, and destroyed depending on the existence or not of a given service, while a user-ID trends to remain while the corresponding user keeps served by the
10 telecommunications system.

[0010] Some examples of service types commonly provided by application server entities AS, and usually assigned to service-IDs for their individual identification, shall now be given with reference to "*Presence*" and "*Instant*
15 *Messaging*" services. A generic description for both services, Presence and Instant Messaging, is provided in IETF-RFC2778 ("*A model for Presence and Instant Messaging*").

[0011] In short, the Presence service comprises the
20 subscription of a user to information related to the status of another user or group of users (e.g.: an "on-line"/"off-line" status information indicating if a given user is presently registered with a terminal in the telecommunications system), as well as the finding and
25 retrieval of the necessary data for the provision of said information. Using the terminology currently used for Presence service, the user who subscribes to obtain status information of other user or users is called "watcher", while the users which provide said status information are
30 called "presentities". Thus, for example, a user acting as "watcher" can subscribe to presence information related to another user ("presentity") or related to a group of pre-

defined users. For this purpose, he can have defined
several lists in an AS entitled to serve a presence service
for a watcher, each list comprising one or various user-IDs
corresponding to the other users and identified by a
specific identifier (i.e.: a service-ID) which identifies a
service instance of a Presence service for a watcher which
concerns to the status monitoring of a set of pre-defined
users. For example, this user can have defined one or more
lists containing user-IDs of a group of friends, of a group
of professional colleagues, of a group of relatives, etc.
Assuming, as an example case, that the service-IDs take a
URI format, a service-ID for lists as mentioned above could
be identified by URIs like (e.g.)
"MyBikerFriends@PresenceService.op2.com",
"AccountDepCompanyX@PresenceService.op2.com", etc.

[0012] If user acting as "watcher" wants to be notified
about what friends of a group of friends in (e.g.) a buddy
list are presently connected to the telecommunications
system, then said user can send a service request from his
terminal which comprises the corresponding service-ID. If
the protocol used to convey signaling messages related to
subscriptions of watchers to Presence service is SIP (e.g.:
as defined in IETF-DRAFT *"Presence Event Package for SIP"*,
draft-ietf-simple-presence-10.txt), then a SIP message
"SUBSCRIBE" containing one of these service-IDs in the
"Request-URI" field of the "SUBSCRIBE" will carry said
service request. When the service request arrives to the
corresponding AS, in order to accomplish with the service
request, the AS can send further SUBSCRIBE messages each
comprising the identifier of a "presentity" comprised in
the corresponding distribution list.

[0013] Briefly, the Instant Messaging service consists in sending small messages that are delivered immediately to "on-line" users (i.e.: users is presently registered within a terminal in the telecommunications system). As in

5 Presence service, one or more lists can be defined for Instant Messaging service, each list comprising a set the identifiers of a set of users, wherein an instance of the Instant Messaging service is identified by an individual service-ID assigned to each list. As opposed to Presence

10 service, wherein the lists of users monitored by a "watcher" user have, generally, a private nature and are thus intended to be utilized by said user, lists for messaging can be publicly known (e.g.: they can be defined in the AS without the need of end user intervention, for

15 example, defined by the telecom operator), thus allowing a plurality of users to send instant messages to a publicly known list. As in the example cited above, assuming service-IDs taking URI format, a service-ID for a list for distributing an Instant Message to a particular group of

20 users   could   be,   for   example, "*DistributionList77@MSGService.op2.com*".

[0014] Similarly as for Presence service, if a given user wants to send an instant message to a given group of users, he can send a service request from his terminal which

25 comprises the corresponding service-ID. If the protocol used to convey signaling messages related to Instant Messaging is SIP (e.g.: as defined in IETF-RFC3428 "*SIP extension for Instant Messaging*"), then a SIP message "MESSAGE" containing one of these service-IDs in the

30 "*Request-URI*" field of the "MESSAGE" (as well as the text message desired to be forwarded) will carry said service request. When the service request arrives to the corresponding AS, to accomplish with the service request,

it can send further "MESSAGE" messages, each comprising an identifier of a receiver user comprised in the corresponding distribution list.

[0015] Further examples of services identified by service-IDs and provided by ASs can be given with regard to dial-in conferencing in a modern telecommunications system, and tele-voting services.

[0016] In a dial-in conferencing service, a user "A" arranges a multiconference which can include, for example 3 more users: "B", "C" and "D". User "A" can connect (e.g.: via HTTP, WAP, etc.) with, for example, an AS which is entitled to provide multiconferencing service (e.g.: by controlling its related signaling and, eventually, controlling a media handler). The AS then assigns a specific service-ID for this specific conference (e.g.: "conf456@homenetwork.com") and gives it back to user "A". The dial-in conference organizer user "A" distributes the service-ID to the other participants to be used at the time pre-arranged for the conference (for example, he can use the aforementioned SIP message "MESSAGE" for this purpose, or send it by other means such as e-mail, short message, etc.). Alternatively, the user "A" can arrange the dial-in conference by other means (e.g.: he contact an operator and receive from him the service-ID). Then, for joining the conference, the participants (users "A", "B", "C" and "D") can send service requests which contain said service-ID and that will be routed towards said AS. Thus, for example, if the protocol used to convey signaling messages is SIP, any of the participants can send a service request to join the conference by sending an INVITE message conveying the service-ID assigned to the dial-in conference (e.g.: "conf456@homenetwork.com") in the "Request-URI" field of

the INVITE. At reception of service requests from the dial-in conference participants, the AS can subsequently establish the corresponding media session (or order its establishment to a media handler) so as to allow media

5   reception from each party and its subsequent distribution to the others.

[0017] In tele-voting services, the users can send service request containing the corresponding service-ID to, for example, control a ranking list or to answer to a public

10   opinion poll. In this case, service requests containing the corresponding   service-ID   (e.g.: "*TheTeleVotingOfTodayYES@TVXZZ.com*") would be routed to an AS which can be entitled to its storage and further processing.

15   [0018] In the examples of services cited above it can be observed that, depending on particularities of a given service type, there can be a plurality of service-IDs, each identifying a specific service instance of a service type (for example, different service instances of a Presence

20   service). Thus, since a specific service-ID is generally intended to uniquely identify a specific service, the term service-ID is used across this text to refer to an identifier of a given service, regardless whether all the possible instances of said service type are identified or

25   not by the same service-ID.

[0019] In earlier telecommunications systems identifiers (either: user-IDs or service-IDs) embedded addressing information, thus allowing the routing of a communication request or a service request using the received identifier

30   (user-ID or service-ID) as such. This was due to the fact that these identifiers were assigned to end-points (e.g.: user's terminals, ASs) according to numbering plans which

were fully related to the geographical location of the end-points; for example: according to the geographical location of a user terminal assigned to a user in the telecommunications system identified by a user-ID, or according to the geographical location of an AS entitled to serve a service identified by a service-ID.

For example, a telephone number such as +34 91 1234567 could be: a user-ID of a user in a PSTN (Public Switch Telephone Network) whose terminal is served by a CS, such as a local exchange in the PSTN, located in Spain (34), in Madrid area (91), and which serves access to (e.g.) 1000 subscribers (e.g.: numbered from 4000..4999). Similarly it could be the service-ID of an individual voice mailbox service served by an AS in Spain, in Madrid area, wherein said AS serves (e.g.) 1000 individual voice mailboxes (e.g.:4000..4999).

Thus, an identifier so assigned (user-ID or service-ID) was directly usable for routing a request (communication request or service request) which contained it towards its final destination.

[0020] However, as new needs appeared (such as mobility, allowing a given user to dynamically register from different geographical/physical locations), said tight (i.e.: non dynamic) identifier-location relationship tended to disappear; thus allowing independence between a user-ID and the corresponding addressing information (AI) usable for routing a communication request towards a terminal of said user.

[0021] Particularly, for services, other needs dealing with factors, such as scalability, reliability and flexible allocation of resources, caused also to make service-IDs independent of the physical location of the respective ASs, and thus, independent of the corresponding addressing

information usable for routing service requests to them. Nonetheless, all the above does not preclude that, in some cases, the addressing information which corresponds to a given identifier (user-ID or service-ID) is the same as
5   said identifier.

[0022] To accomplish with a flexible relationship between identifiers (user-IDs and service-IDs) (usually static) and their corresponding addressing information (usually dynamic) a specialized server entity (hereinafter referred
10 as *location server entity*, LS) is provided in state-of-the-art telecommunication systems. Examples of location server entities LS are: HLRs (a Home Location Registers) in 2nd. generation mobile systems, HSS (Home Subscriber Servers) in 3rd. generation mobile systems, *"Redirect Servers"* in SIP-
15 based systems, or *"Gatekeepers"* in H.323-based systems.

[0023] A LS stores what is commonly known as location information, which comprises a plurality of identifiers (user-IDs and/or service-IDs) and the corresponding (dynamic) addressing information (AI) usable for routing
20 requests that contains any of said identifiers.

[0024] The kind of addressing information AI stored for a given user-ID or service-ID in an LS can vary according to different implementations. For example, AI can contain: network addresses (i.e.: ISO Layer-3 addresses, such as IP-
25 addresses); data-link layer addresses (i.e. ISO Layer-2 addresses); aliased addresses such as URIs which can be further translated to (e.g.) the corresponding network address, for example, by means of a further DNS (Domain Name System) query; etc. Also, the entity addressed by the
30 AI stored in relationship with a given identifier can vary; thus, for example, the AI can contain an address of a CS which is entitled for serving access to a given user

terminal or to an AS, an address of a user terminal or an
address of an AS hosting a service, etc. Furthermore, in
addition of an address, or instead of it, addressing
information AI can contain data (hereinafter referred as
5   "*address-determining-capability*") that can be utilized to
further select a CS which can serve access to a given user
terminal or to an AS (e.g.: a CS capability data which can
be used to find a CS matching said capability). Examples of
this latest case, wherein an address-determining-capability
10 is utilized, can be found in chapter 6.1.1 ("User
registration status query") of the 3rd. Generation
Partnership Project 3GPP Specification TS 29.228 (V5.2.0,
Dec-2002), named as Serving-CSCF capabilities ("*S-CSCF*
capabilities"); and also in chapters 3.6 ("*Location-Info-*
15 *Answer LIA Command*") and 5.5 "*Server-Capability AVP*" of the
IETF-DRAFT "*Diameter Multimedia Application*" (*draft-*
belinchon-aaa-diameter-mm-app-00.txt, Feb-2003), named as
"*Server-Capabilities*".

[0025] Accordingly, a communication server entity CS, at
20 reception of a communication request or of a service
request, can obtain from a LS the addressing information it
needs for routing said received request towards its final
destination; wherein, as will be later detailed, the way a
CS obtains addressing information for identifiers (user-IDs
25 or service-IDs) from a LS can vary according to different
implementation alternatives (e.g.: a location query, a
redirection indication). In summary, well-known techniques
allow to route service requests in a state-of-the-art
telecommunication system according to the service-IDs they
30 contain, so as to forward said service requests towards the
corresponding AS using equal (or substantially similar)
routing techniques as the ones utilized for routing
communication requests between user terminals.

[0026] An AS can be entitled to serve a given service for all its instances, for some of them, and even it can be arranged to serve a plurality of different services. In any case, since the provision of a given service relies on the
5   intervention of an AS entitled to serve it, the availability of said AS can be of a major importance, since it is likely to consider it can receive a high rate of service requests from different users. Therefore, it should be desirable that its processing means are mainly dedicated
10 to serve only those service requests which are qualified to be served, while minimizing the processing time and resources used to detect (and, eventually, reject) those service request which, by any reason, are unsuitable to be served.

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SUMMARY OF THE INVENTION

[0027] It is an object of the present invention to minimize the impact in an application server of those service requests which are not likely to be attended.

5   [0028] This object is achieved by a method as claimed in claim 1. This object is also achieved by a location server entity as claimed in claim 13 or by a communication server entity as claimed in claim 21, which can cooperate with an application server entity as claimed in claim 27. This
10 object is also achieved by a computer program as claimed in claim 28, or by a computer program as claimed in claim 29.

[0029] In one aspect, the invention relates to a method for routing in a telecommunications system a service request related to a service identified by a given service
15 identifier and hosted in an application server entity. When a service request arrives to a communication server entity in said telecommunications system, a usage rule is checked before granting the usage of the corresponding addressing information related to said service identifier. The usage
20 rule can comprise one or more individual conditions that a service request containing a given service identifier shall fulfil before it is further routed towards the corresponding application server entity. The usage rule can be sent from an application server entity to a location
25 server entity which serves location information to a plurality of communication server entities so that, when, for example, a location query is received in said location server requesting addressing information usable for routing a service request containing a given service identifier,
30 the corresponding usage rule can be checked, and thus, said location server can provide or deny the corresponding

addressing information accordingly. Alternatively, the
usage rule can be downloaded in one or various
communication server entities, either: directly from an
application server, or from a location server; so that, any
5   of the communication server entities, at reception of a
service request can check the usage rule which corresponds
to the service identifier contained in said request before
taking further steps to route it towards its destination.

[0030] A method according to the invention ensures that
10   only service requests which are, according to the
corresponding usage rule, likely to be attended by the
corresponding application server are routed to it. Since a
service request can be stopped (i.e.: not further routed)
in an early stage before it gets to the application server,
15   the adverse effects of *Denial Of Service* attacks against
the resources of a telecommunications system are thereby
minimized, particularly in what concerns the resources
hosted and/or utilized by application servers. With an
appropriate setting of the corresponding usage rules, the
20   method also allows to apply different routing conditions
for routing service requests related to a plurality of
different services.

[0031] In a further aspect, the invention relates to a
location server entity which stores in relationship the
25   identifier of a service hosted in an application server
entity and addressing information usable for routing a
service request containing said service identifier, and
which is arranged to provide said addressing information
for routing a service request containing said identifier.
30   According to the invention, the location server entity
further stores a usage rule which states the condition(s)
for granting the usage of said addressing information for

routing purposes, and is further arranged to provide said addressing information only if it does not contravene the usage rule. Further, in another aspect, the invention relates to a computer program which, once loaded in a computer-based machine, such as a computer-based location server, makes it to provide information for routing a service request as described here in relationship with a location server entity according to the invention.

[0032] A location server entity as described herein prevents, by denying the provision of the necessary addressing information, an improper or unseasoned service request containing a given service identifier to get the application server which hosts the service identified by said service identifier.

[0033] In a further aspect, the invention relates to a communication server entity which is arranged to receive a service request, obtain addressing information related to a service identifier contained in said service request, and further route the service request using said obtained addressing information. According to the invention, the communication server entity is further arranged to obtain a usage rule which determines if said addressing information can be used for routing purposes, and to further route the received service request only if it does not contravene the usage rule. Further, in another aspect, the invention relates to a computer program which, once loaded in a computer-based machine, such as a computer-based communication server, makes it to route a received service request as described here in relationship with a communication server entity according to the invention.

[0034] A communication server entity as described herein prevents an improper or unseasoned received service request

containing a given service identifier to get the application server which hosts the service identified by said service identifier, by denying the further routing of said service request.

5   [0035] In a further aspect, the invention relates to an application server entity which is arranged to communicate with a second server entity which can intervene in the signaling of a service request, such as a location server entity or a communication server entity. According to the

10 invention, the application server entity sends to a second server entity a usage rule which grants the usage of the corresponding addressing information which is related to a given service identifier. An application server entity according to the invention can thus be further adapted to

15 comply with any of the embodiments of the method described before.

[0036] By its cooperation with a location server entity and/or with a communication server entity, an application server entity as described herein allows, to set or modify

20 at any time the condition(s) for routing a service request related to a service, by simply notifying the new or otherwise modified usage rule to a location server which stores location information related to said service, or to a communication server which can receive and further route

25 a service request related to said service. The content of the usage rule sent by the application server entity can depend, for example, on dynamic conditions known by said application server and can be related to a service that it hosts or that is hosted by another application server.

30

BRIEF DESCRIPTION OF DRAWINGS

[0037] Figure 1 shows a layered schematic view of a state-of-the-art telecommunications system showing various functional entities on each layer.

5   [0038] Figure 2 shows an schematic view of some functional elements in a state-of-the-art server entity in a telecommunications system.

[0039] Figure 3 shows an example of a data structure stored in a server entity according to the invention.

10   [0040] Figures 4, 5 and 6 shows simplified signaling flows according to various embodiments of the invention.

DETAILED DESCRIPTION

[0041] Some exemplary embodiments of the invention shall now be described in detail with references to figures 1 to 6.

5   [0042] Fig.1 shows a logically layered schematic view of a generic state-of-the-art telecommunications system showing various server entities. The abstraction represented in Fig.1 does not intend to relate to a specific telecommunications system nor intends to depict all the
10 possible server entities which can exist on it, but rather those which, being commonly implemented in modern telecommunications systems, are relevant to illustrate the invention.

[0043] The lowest layer (1) shown in Fig.1 comprises a set
15 of access points (4,5a,5b) which provide the physical (wired or wireless) connection of the user's terminals (not shown) to the telecommunications system so as to allow said terminals exchange signaling and/or media with server entities in the telecommunication system. The nature of an
20 access point determines the functions it has to provide. Access points can range from simple wired point-to-point connections, to more complex connections which can require signaling and/or media transcoding for the information exchanged with terminals and other server entities in the
25 telecommunications system. Local access policy and control functions, can also be carried out by access points. Depending on the access types supported in a telecommunication system, this layer (1) can comprise: radio base stations (4), providing radio access to mobile
30 terminals; LANs (Local Area Networks) (5a) or a WLANs (wireless LANs) (5b) providing access, respectively, to

terminals wired or wireless connected to said LANs or WLANs; point-to-point cables and/or fiber connecting a user terminal to a communication server entity (CS); etc.

[0044] The second layer (2) depicted in Fig.1 comprises a set of server entities (CS1,CS2,CS3,LS1,LS2) which are intended to intervene in the signaling of communications and services which are provided through the telecommunications system. Eventually, CSs can also intervene in the switching, routing or control of the media exchanged in said communications and services. Since a telecommunications system can comprise many access points (4,5a,5b) being located at very distant geographical locations, it usually comprises a plurality of communication server entities (CS1,CS2,CS3) entitled to receive and further route signaling to/from two (or more) end-points of a communication (e.g.: two or more terminals, one terminal and one AS, etc.). As cited earlier, various kind of communication server entities (CS) are known state-of-the-art telecommunications systems; wherein, some of them can be dedicated (or assigned) to serve the access to end-points, by routing to/from them the signaling related to communications or services and, when needed, route said signaling to/from other CSs, while other CSs can be dedicated to provide inter-connection between CSs (e.g.: meshing CSs of various network operators and/or different geographical areas within a telecommunication system).

[0045] Location server entities (LS1,LS2) depicted in the second layer (2) of Fig.1 store addressing information usable for routing communication requests and/or service requests based on an identifier (user-ID, service-ID) contained in said requests. Accordingly, LSs are arranged to facilitate to the CSs the necessary addressing

information to route service and communication requests received in said CSs; although, in some implementations, they are arranged to facilitate the appropriate addressing information to a user terminal, so as the user terminal can

5   route a communication request or a service request using the received addressing information (e.g.: as it is described for a H.323 Gatekeeper in figure 26 in ITU-T Recommendation H.323, Nov-2000, with respect to the "*Direct Endpoint Call Signalling*" mode).

10   Within a telecommunication system, more than one LS can exist depending, for example, on scalability and reliability factors, and also depending on the number of network operators and/or network domains in said system.

[0046] The way a CS obtains addressing information for

15   identifiers (user-IDs or service-IDs) can vary according to different implementation alternatives.

[0047] For example, a CS intermediating in a signaling which has received a signaling message conveying a service request (e.g.: a SETUP message, an INVITE message, an IAM

20   message, etc.) can send a location query to a LS containing the service-ID received in said request. Examples of location queries are: MAP (Mobile Application Part) operations such as "*SendRoutingInfo*" in a 2nd. generation mobile system, "*Cx-query*" or "*Cx-Location-Query*" in the IMS

25   of a 3rd. generation mobile system, "*Location Request*" (*LRQ*) in an H.323 system, DNS queries (e.g. as described in IETF-RFC3263), etc. As a result of said location query, the LS sends back a response (e.g.: "*SendRoutingInfoACK*", "*Cx-query Resp*", "*Cx-Location-Query Resp*", "*Location Confirm*"

30   *LCF*, etc.) containing the corresponding addressing information usable for routing the received service request. Alternatively, a LS can receive a signaling

message conveying a service request from a CS, and answer back to said CS with a redirection indication message which contains the appropriate addressing information usable for routing said request (e.g.: a *Redirection* response "3XX" as

5   defined in IETF-RFC3261 for SIP protocol).

[0048] In some cases, a CS can embed LS functionality, or, in other words, there can be a CS-LS co-location of functionalities. For example, a CS can use cache techniques and store (e.g.: during a pre-defined time) location

10   information so as to avoid a further query to a LS; thus, said CS can utilize addressing information for an identifier (user-ID or service-ID) which was previously obtained in a previous query to a LS with the same identifier. Also, a CS can obtain addressing information

15   for identifiers (user-IDs or service-IDs) from a LS without a previous query message sent from the CS to the LS as a result of a service or communication request received in said CS. Thus, for example, a CS can receive off-line information from a LS so as to build up routing tables

20   comprising a plurality of identifiers with their corresponding addressing information. Furthermore, a CS can receive addressing information for some identifiers from a management system (e.g.: as a part of its configuration data). In other cases, as a CS can be involved in the

25   registration and/or admission process of an end-point (e.g.: a user terminal, or an AS for a service), it can learn during said process an address of the end-point and store it as addressing information usable for routing further signaling towards said end-point.

30   [0049] The third layer (3) of Fig.1 comprises specialized server entities devoted to the provision of services (application server entities AS1,AS2). As it is done for

user terminals, a CS can be assigned to serve signaling to/from said AS related to services it is entitled to serve.

[0050] In Fig.1 communication lines (6,7) are shown to
5   illustrate (plainly) the communication between entities in the different logical layers (1,2,3) depicted in the figure for exchanging signaling, control data, etc. However, it shall be understood that server entities within the same logical layer (as depicted in the abstraction of Fig.1) can
10 also communicate. Details for achieving the communication between the server entities (CSs, LSs, ASs) depends on implementation details of the communication network(s) existing in the telecommunication system. For example, communication between server entities can take place across
15 one or more underlying communication networks using the same or different underlying communication technology (e.g.: ATM based, IP based, etc.), can be coded according to the same or different communication protocol (e.g.: SIP, H.323, etc.), and can involve the intervention of other
20 server entities not shown in Fig.1 (such as DNS servers, signaling gateways, etc.).

[0051] Fig.2 shows an schematic view of some functional elements in a state-of-the-art server entity (8), such as a CS, a LS or an AS. In general, a server entity in a
25 telecommunications system comprise processing means which are arranged to exchange information (e.g.: sending and/or receiving signaling messages, queries, configuration information, control data, etc.) with other server entities in a telecommunications system, and to process it.
30 Depending on the specific functionality performed by the server entity (8), said processing means can be arranged to perform various functions. For example, processing means in

a CS can be arranged to receive signaling messages conveying requests, and further handle them; wherein said further handling can comprise the analysis of the content of a received message and also its subsequent routing

5 towards another server entity or towards a user terminal, together with the achievement of addressing information when needed. In a LS its processing means can be arranged to receive location queries and/or service requests, and to answer back with (respectively) query responses and/or

10 redirection indications containing the corresponding addressing information usable for routing.

[0052] For these purposes (and assuming the server entity 8 is implemented within a computer based machine), the processing means can comprise a processor (PR) and a memory

15 (MEM) storing the processing instructions to be executed by the processor (PR), as well as one or more communication devices (IOD) for sending or receiving said signaling and for exchanging other kind of information with other entities or devices through communication lines (9,11). One

20 or more internal buses (10) can be provided to allow internal exchange of data between the processing elements (PR,MEM,IOD) depicted in the server entity (8) of Fig.2.

[0053] For the storage of data which may be needed when processing received requests, queries, etc, data storage

25 means (LDB) can also be provided in a server entity (8). Thus, for example, said data storage means can contain a list of bindings between user and/or service identifiers and the corresponding addressing information for each of these identifiers. Since the volume of information to be

30 stored can be high, the storage means can be externally allocated (e.g.: in a dedicated storage server to which server entity 8 access through communication line 11, such

as a location service data base) or co-located within the same machine implementing the server entity (8). In the latest case, the same storage means can be arranged to store both: the processing instructions and the binding
5   identifiers-addressing information mentioned above.

[0054] In a telecommunications system as described heretofore with reference to Fig.1, a signaling message conveying a service request from a terminal, before it gets to the corresponding application server entity (AS), can
10 pass through one or various communication server entities (CS), and can involve the intervention of one or more location server entities (LS). Thus, for example, the service request can pass through a first CS serving the access of the requesting terminal (e.g.: CS1), a second CS
15 serving the access of the AS (e.g.: CS3), and a third CS (e.g.: CS2) acting as transit between CS1 and CS3. Although it can involve only the intermediation of only one CS, for example, in case said CS is serving both: the requesting user terminal and the AS.

20 [0055] According to the invention, a usage rule (UR) can be utilized to block a service request before it gets the AS which hosts the service logic to attend said request, by neglecting or granting the usage of the addressing information AI necessary to route said service request;
25 thus preventing an undesired, unauthorized or unseasoned access to a service.

[0056] Depending on implementation details, a service-ID can be defined by the AS, by a user, or in combination. For example,   in   a   service-ID   such   as
30 "*FriendList4@PresenceService.op2.com*",   the   part "*FriendList4*" can be defined by the user, and the part "*PresenceService.op2.com*" be defined by the AS. In any

case, the whole service-ID is basically intended to be unique so as to allow to distinguish a specific service, or a specific service instance of a service, in the corresponding AS. Thus, a usage rule (UR) according to the
5   invention can be defined to control the access to the service it relates and structured (as will be later detailed) so as to monitor one or a plurality of aspects related to said service which can make its execution suitable or unsuitable to be invoked.

10   [0057] Preferably, a usage rule UR is defined per service-ID, although other embodiments are also possible in which the same UR can apply to more than one service-ID (e.g.: to different service-IDs of different services, to all service-IDs related to the same service type, etc.).

15   [0058] Although a usage rule can be defined in connection with a service-ID, it can be stored in relationship with a service-ID and/or with the corresponding addressing information AI for said service-ID; thus, depending on storage implementation details, a UR can be stored either:
20   directly or indirectly related with a service-ID and its corresponding AI. Fig.3 shows an illustration of a possible storage structure (SID,AI,UR) which contains, as an example, three different service-IDs (SID column) in relationship with their corresponding addressing
25   information (AI column) and usage rules (UR column).

[0059] A location server entity (LS) can thus store a data structure as in Fig.3 which comprises also UR. Similarly, since some CSs can also store location information (e.g.: previously cited features of CSs dealing with off-line
30   building of routing tables, cache of location information, involvement in a registration process, etc.), the data structure of Fig.3 can also be stored in a CS.

[0060] Some embodiments related to the possible structure and function of the usage rule UR shall now be given with reference to the example case illustrated in Fig.3. It shall be understood that, according to the granularity
5   desired to prevent unsuitable service requests to arrive to an application server entity for a given service, the corresponding UR to be checked can contain one or more use conditions (T1, T2 ,T3 ,M ,U) stating each a particular requirement for a service request to progress towards its
10   destination. The use conditions (T1, T2 ,T3 ,M ,U) defined in a given UR shall preferably cover the dynamic/temporary nature of the service it relates and, therefore, the dynamic/temporary nature of the corresponding service-ID. Accordingly, the use conditions structuring a given UR can
15   preferably cover factors such as: the time when a given service can (or should) be provided, the time when said service can not (or should not) be provided, the maximum time that can elapse since said service can be provided from its first provision, the maximum number of times that
20   said service can be provided, the user (or users) who are allowed to request said service, etc; and combinations thereof. Therefore, in a preferred embodiment, an UR for a given service is distributed by an application server entity to further server entities which can intervene in
25   the signaling of a service request related to said service (e.g.: distributed to LSs and/or CSs). Also, in a preferred embodiment, the UR (or a part of its use conditions) can be determined in the application server AS based on dynamic and/or temporary conditions known by the AS (e.g.: its
30   present traffic load, the suitability to provide a given service in a given time period, etc.), as well as in permanent ones.

[0061] Preferably, a service request shall progress towards its destination only if all the use conditions stated in the corresponding usage rule UR for the service-ID it contains are fulfilled. Other embodiments are also

5   possible wherein, for example, upon failure on the checking of a use condition of a UR, other actions different from the service rejection can be performed, such as the use of only a certain addressing element among a plurality of addressing elements that, as will be later detailed, can be

10 stored in the addressing information for said service-ID.

[0062] The first service-ID depicted in Fig.3 can relate to a dial-in conference which is identified by the service-ID *"confABC@ConfService.op2.com"*. Its corresponding UR states, as illustrated: a "first time" condition (T1), a

15 "requesting user" condition (U), and a "maximum usage" condition (M); which, respectively, can be used to control: a start-time (e.g.: *"p"*) from which said service can be provided, the identifier of the user or users who can request said service (e.g.: user-IDs such as *"bob@op2.com"*,

20 *"joe@op3.com"*, *"alf@op2.com"*, *"kate@op1.com"*), and the number of times a service request can be sent for said service (e.g.: *"n"* times) . Thus, according to this example case, starting from the time and/or date determined by the content of the start time condition T1, any of the users

25 listed under the requesting user condition U (*"bob@op2.com"*, *"joe@op3.com"*, *"alf@op2.com"*, *"kate@op1.com"*) can send service request for joining the dial-in conference.

[0063] The maximum usage condition M could be redundant in

30 some cases wherein, as in the dial-in conference example cited above, the maximum usage of a given service can be implicitly limited by the number of users authorized to

send service requests (e.g.: 4 users in the example case cited for the dial-in conference above). However, it can be useful for cases wherein no requesting user condition (U) has been set, or for cases wherein U has been set for a

5   wide list of users who can tentatively join or delegate in another listed user. In any case, M can be used to determine the number of times a service request containing the service-ID to which it relates can progress towards the corresponding application server entity (AS); therefore, it

10   can advantageously be used to pre-determine a maximum use of a given service depending, for example, on the fee paid (or to be paid) for accessing the service, on the resources in an AS dedicated for a given service, on the relevance and/or suitability of providing a service more than a given

15   number of times, etc.

[0064] For a given usage rule UR, the requesting user condition U can store one or more user-IDs of one or more users, being said user-ID(s) stored in any well-known format (e.g.: URI, E.164, h323-ID, etc). The identity of

20   the user which sends a service request can be obtained from the signaling message conveying request itself and can be included, together with the received service-ID, within a subsequent location query which is sent to further route said request; for example: it can be obtained from the

25   "*from*" header in a service request coded according to SIP, or from the parameters "*sourceAddress*" or "*Calling Party Number*" in a service request coded according to ITU-T recommendation H.225.0. Accordingly, since, as mentioned earlier, some users can have a plurality of user-IDs

30   assigned in a telecommunications system, preferably a requesting user condition U of a given usage rule UR stores the plurality of user-IDs of a given user which is intended to be listed in said requesting user condition U.

[0065] The time information stored in the first time condition T1 can vary depending on the desired accuracy for the start-time it controls. For example, T1 can contain a time-and-date value form (e.g.: day/month/year:time) which would determine a given time in a given date; wherein the precision can be established according to the minimum time unit stored (e.g.: hour, minute, etc.). Similarly, T1 can contain only a date value (e.g.: 23/12/2003); thus allowing any moment in that date for start requesting the service it relates. Also, it can contain only a time value (e.g.: 14:00) which sets up an start-time, regardless of the day, from which said service can be provided. The time information stored in T1 can also contain a plurality of values, each stating different time/date values, thus allowing set up different start-times for different dates.

[0066] The second service-ID in Fig.3 ("*distlist7@MSGService.op2.com*") can relate to an Instant Messaging service for message distribution. Conditions T1 and U have the same meaning as described above for the first service-ID, while for this case the usage rule (UR) also comprises a "second time" condition (T2) which controls a stop-time (e.g.: "*q*") from which said service shall not be provided. Thus, according to the example case shown for this service, it can be provided for the users listed in U ("*ann@op2.com*", "*awk@op1.com*", "*mat@op2.com*", "*john@op3.com*"), so as to allow any of them to send a service request containing the service-ID above that will make an "instant message" to be sent to the user/users who has/have been defined in the corresponding distribution list; wherein service requests from said users would be allowed to be received starting, as soonest, at "*p*" and ending, as latest, at "*q*".

[0067] It shall be noticed that the second time condition T2, whose content and accuracy can be set up as described earlier for the first time condition (T1), can work independently of said first time condition; thus, allowing

5 to stop service request for a given service at a given stop-time, regardless any pre-defined start-time.

[0068] The third service-ID in the example case shown in Fig.3 ("*friendList@PresenceService.op2.com*") can relate to a Presence service so as to provide to a watcher user

10 presence information related to a list of users. The start-time condition T1 have the same meaning as described above for the first or second service-ID exemplified in Fig.3. In this example case, the requesting user condition U contains the user-ID of only one user ("*joe@op3.com*"), since, given

15 the nature of the service, it can be appropriate that only the user who has subscribed the Presence service and defined the user (or users) which he wants to obtain presence information from, is entitled to send the subsequent service requests. In this case, the usage rule

20 (UR) further comprises a "third time" condition (T3) which controls the maximum time gap for accepting service requests for said service, from the first time it is requested. Thus, in this example case, the user listed in the requesting user condition U ("joe@op3.com") can send

25 service requests containing the aforementioned service-ID ("*friendList@PresenceService.op2.com*") starting at the time/date determined by T1 ("*p*"); wherein the service will no longer be provided for said service-ID after a given time, determined by T3 ("*r*"), starting from the first

30 service request.

[0069] According to various implementation alternatives, the accuracy of the time gap determined by the third time

condition T3 can be adjusted accordingly. For example, the value of T3 can be represented by an integer value, wherein its precision can depend on the time unit (e.g.: days, hours, minutes, etc.) said integer represents.

5   [0070] For a given usage rule UR which contains a time condition T1 and/or T2, a server entity which checks said condition (e.g.: a LS or a CS) will have to be provided with time-date means arranged to keep an updated value representing the actual time and/or date; so, when time
10   conditions specified T1 and/or T2 of a usage rule UR have to be checked in a given moment, the actual time represented in said time-date means can be compared with any of said time conditions, and thus, determine if the service request which triggered said check in said moment
15   can progress or not towards its corresponding destination AS. As in many of the well-known computer based apparatuses (such as personal computers), time-date means are commonly implemented in most of the server entities of a telecommunications system for various purposes, such as
20   time-stamping of messages, logging of events, etc; wherein said time-date means can rely on an internal clock within the server entity and/or time/date signals received from a further entity. Thus, according to the invention, only the processing means of a location server LS or a communication
25   server CS which already implements said time-date means needs to be further arranged to compare the time and/or date represented on said time-date means with the time and/or date stated by a time condition (T1 and/or T2) of a usage rule UR.

30   [0071] Similarly, for a given usage rule UR which contains a third time condition T3, a server entity which checks said condition (e.g.: a LS or a CS) is arranged according

to the invention to monitor the time elapsed since a UR
containing said third time condition T3 is checked in said
server for the first time (which can imply the first
service request containing the service-ID to which the UR

5   relates to), until a further checking take place. Various
implementation alternatives can be selected to achieve this
feature. For example, the first time the server entity
checks any of the conditions of a UR, it stores in
relationship with said UR a time-stamp containing the

10   current time of said checking; wherein said time-stamp can
contain day, hour, minute, etc, according to the desired
accuracy considerations mentioned earlier. Then, when a
subsequent checking over condition T3 of said UR takes
place, a comparison can be performed between the time

15   elapsed (i.e.: current time minus the time stated in the
time-stamp) and the maximum time stated by T3.

[0072] Alternatively, a clock-controlled counter can be
utilized. When the first check over a UR takes place, said
counter can be set to a zero value or to its maximum value,

20   and then, alternatively, incremented or decremented as the
time elapses. This can be achieved, for example, with a
time-related processing routine which is started
periodically and which, among other possible actions,
increment or decrement the value of said counter.

25   Accordingly, a subsequent checking over the condition T3 of
said UR is accomplished either: by comparing the actual
counter value with the value stored in T3 (in case of
initial zero setting of the counter), or by checking that
the counter value is not zero (in case of initial maximum

30   value setting of the counter). The option in which the
counter is periodically decremented according to the
elapsed time allows to implement the counter within the
same storage area which stores the value T3 of a UR; thus,

in a given moment, the value stored in the T3 field of a UR
would state the "remaining time" which left for accepting a
service request containing the service-ID said UR relates
to.

5   [0073] In order to control the maximum usage condition (M)
of a usage rule UR, a similar technique as the alternative
cited above for T3 can be implemented by implementing a
counter which can be set to zero and incremented with each
checking until it gets its maximum value, or decremented
10   with each checking from its maximum value to zero. Also, as
cited above in relationship with the decrementing counter
option of T3, the value of M can be directly decremented
with each checking, thus avoiding the need of an additional
counter for M. Accordingly, when the M value of a UR is
15   going to be checked, it can be first verified if its value
is different from zero. If it is not zero, then M shall be
decremented. Advantageously, the M condition of a UR is
checked the last in case of other conditions (T1, T2, T3,
U) exists for said UR; so, it is only decremented (or
20   incremented) if all the conditions stated in the UR are
satisfied.

[0074] As cited earlier, the location information stored
in a location server LS or in a communication server CS
comprises an identifier and the corresponding addressing
25   information AI for routing a service request which contains
said identifier. The nature of an element stored as AI can
vary according to different addressing implementations and
addressing options in a telecommunications system. The
example shown in Fig.3 considers some of them which have
30   been noted as "AA" (an address of an application server
AS), "AC" (an address of a communication server CS), and
"AD" (an address-determining-capability that can be

utilized to find a CS matching it, and which can further
route a service request with said identifier towards its
final destination). However, it shall be understood that
the notation used in the figure (AA, AC, AD) does not

5   necessarily imply that the nature of the stored addressing
information needs to be coded together with the addressing
information it relates so as to specify its type (e.g.:
whether it is an address of an AS, or an address of a CS,
or an address-determining-capability).

10   [0075] In Fig.3, for the dial-in conference service
identified by the service-ID "confABC@ConfService.op2.com",
the addressing information comprises (AA) a URI of the AS
which is entitled to serve it, "ConfServer27.op2.com".
Thus, for example, the network operator "OP2" can have a

15   plurality of ASs, wherein one of them (e.g.: aliased as "
ConfServer27") has been assigned to serve the service
identified by this service-ID.

[0076] The addressing information shown in Fig.3 for the
Instant Messaging service identified by the service-ID

20   "distlist7@MSGService.op2.com" contains two elements. The
first one (AA) contains an IP-address of the AS assigned
for said service, "213.64.82.162", and the second one (AC)
is a URI of a communication server CS which can be the CS
serving access to said AS, or can be a CS having the

25   required capabilities to intervene in the signaling to/from
said AS. The two addressing elements (AA, AC) shown in this
example case, are given just to illustrate that, depending
on various addressing alternatives, the addressing
information stored for a service-ID can vary on its nature

30   and even be multiple; thus allowing to select one of them
and use it for routing the service request depending on
addressing policies which can determine, for example, if a

service request can be routed directly using an address of
the concerned AS, or if it has to be first routed through a
given CS, etc. In turn, said addressing policies can be
dependent on factors such as the time of the date, the
5   origin domain of the request, etc, and also (as mentioned
earlier) be dependent on if a given use condition (T1, T2,
T3, M, U) of the corresponding usage rule UR has not been
fulfilled by the service request.

[0077] A further example of multiple addressing elements
10   for the same service-ID is given for the Presence service
identified   by   the   service-ID
"*friendList@PresenceService.op2.com*"   in   Fig.3.   In   this
case, the corresponding addressing information AI comprises
two   addressing   elements   (AA,AD);   wherein   the   first   one
15   (AA) contains a URI of the AS assigned to serve a request
containing said service ID, "*PresenceServer9.op3.com*", and
the   second   one   (AD)   contains   the   value   of   an   address-
determining-capability   to   select   a   communication   server
entity CS which can intervene in the signaling to/from said
20   AS, which is shown as an hexadecimal representation of a 32
bits value "*H'9A17FBC6*" according to the *Unsigned32* coding
stated   in   the   aforementioned   IETF-DRAFT   "*Diameter
Multimedia Application*" (*draft-belinchon-aaa-diameter-mm-
app-00.txt*).   It   shall   be   understood   that   when   an   address-
25   determining-capability   is   utilized   to   select   a   CS,   a
further processing is needed to determine an address of a
CS from a specific *Unsigned32* value (e.g.: a look-up table
matching CSs with unsigned 32-bits values). However, said
further   processing   is   beyond   the   scope   of   the   present
30   application.

[0078] Some embodiments of the invention showing various
routing   cases   of   a   service   request,   as   well   as   the

distribution and applicability of a usage rule UR according
to the invention, shall now be described with reference to
the signaling flows of figures 4 to 6. In all these
figures, an application server entity (AS) has been

5 entitled to process service requests related to a service
identified with a given service-ID.

[0079] In the routing of a service request from the
originating end-point towards the destination application
server entity AS, there can be more server entities

10 intervening (i.e.: intermediating in the signaling and/or
providing addressing information) as the ones depicted in
the routing cases shown in figures 4 to 6 (CS, CS1, CS2,
LS). For example, the service requests which appears as
first received in a communication server (CS,CS1) (flows f2

15 in Fig.4, g3 in Fig.5, h2 in Fig.6), can come from another
communication server (not shown). Similarly, the service
request which appears finally to be sent directly to the AS
from a communication server (CS,CS2), can be routed through
a further communication server (not shown). However, for

20 the sake of a greater clarity, only those server entities
which are relevant to illustrate one aspect of the
invention have been shown on each case.

[0080] In flow f1 of Fig.4, the AS sends location
information which comprises one or more service-IDs and the

25 corresponding addressing information for routing service
requests containing said service-ID(s) to a location server
entity (LS). As cited earlier, the addressing information
can contain, for example, an address of an AS, and/or an
address of a communication server entity (CS) which can

30 intervene in the signaling towards said AS, or an address-
determining-capability to determine an address of said CS.

[0081] The information sent in flow f1 can further comprise a usage rule UR to grant the usage of the received addressing information. For example, it can contain a UR for each of the indicated service-IDs, or a UR for more than one (or all) of the indicated service-IDs. According to various implementation alternatives, the UR can be sent from the AS to the LS within the same message as the addressing information, or in a separate message which, for example, can include the service-ID to correlate the UR with the service-ID it relates. This latest option allows to modify the UR of a given service, without changing any other data related to it (e.g.: service-ID or addressing information).

[0082] Flow f1a shows an optional embodiment wherein the AS sends a usage rule UR in relationship with the service-ID said UR relates to a communication server entity (CS). Since, as mentioned earlier, some CS can store addressing information so as to route a service request based on its own stored addressing information for a service-ID contained in said request (thus avoiding a further query to a LS), the information sent in flow f1a can comprise also the corresponding addressing information for the service-ID(s) received; wherein, as mentioned above for the LS, the location information for a given service (service-ID, addressing information) can be received in the CS together with the corresponding UR, or separately.

[0083] The content of a usage rule UR for a given service-ID can be determined according to various alternatives. For example, it can be determined automatically within a server entity (AS, LS, CS) (e.g.: according to tables which relate service-IDs, or a part of them, with the corresponding UR values). Also, in addition to the reception of a UR from an

application server entity as explained above, a UR can be defined by other means in a LS and/or in a CS, such as by means of OAM (Operation, Administration, Maintenance) procedures; being this useful for cases for cases wherein the same UR can apply to a plurality of service-IDs.

[0084] According to the signaling flows shown in figures 4 to 6, the AS which intervene in the transmission of the UR towards a LS (or towards a CS) appears to be the same as the AS finally receiving the service requests (flows f5, g4, h6). However, other embodiments are also possible wherein, other server entity (such as an AS specially entitled for the distribution of URs) which is not the AS entitled to receive the corresponding service request, intervenes in the transmission of a UR (flows f1, f1a, g1, g1a, h1, h1a).

[0085] Flow f2 represents the reception of a service request containing a service-ID in the CS. Assuming that the CS has not stored previously addressing information for this service-ID, it sends a location query (flow f3) to the LS which contains the received service-ID. Alternatively, flow f3 can represent a forwarding of the service request received in the CS towards the LS; that could be the case wherein, for example, an unconditional routing is programmed within the CS (e.g.: for all the received requests or according to an identifier received in a request), and wherein the LS behaves as a redirect server. In either case, the LS then checks the usage rule UR which relates to the service-ID received and verifies if all the use conditions stated in said rule are fulfilled.

[0086] In case of a successful checking of the UR, the LS answers back in flow f4 to the CS (either: query response, or a redirection indication) with the corresponding

addressing information which, as cited earlier, can be an
address of the AS which shall receive said service request.
Then, the CS, using said addressing information, forwards
in flow f5 the received requests towards the AS.

5   [0087] If the check of the UR fails, then the negative
result can be sent from the LS to the CS in flow f4; this
can be accomplished, for example, by sending in f4 an empty
value in the addressing information (or a predefined
"default value"), and/or by indicating explicitly a
10   negative result. The reception of a negative result would
cause the received service request to be rejected back from
the CS in flow f6 according to the utilized signaling
protocol (e.g.: a *Request Failure* response "4XX" as defined
in IETF-RFC3261 if SIP protocol is used an *INVITE* message
15   was received, a RELEASE COMPLETE message H.225.0 protocol
is used and a SETUP message was received, etc).
Alternatively, as mentioned earlier, in case of failure
when checking the UR (or any of its use conditions) other
actions (not shown) different from the service rejection
20   can be performed, such as to route the received service
request through a given server entity (e.g.: a further CS,
or a further AS). This can be accomplished by giving back
in flow f4 an address element (AA, AC, AD) provided for
said purpose.

25   [0088] Fig.5 shows an alternative embodiment wherein the
usage rule UR is checked in a communication server CS which
receives a service request. In Fig.5, flows g1 and g1a are
equivalents to, respectively, flows f1 and f1a previously
described with reference to the embodiment illustrated in
30   Fig.4, with the particularity that, as an option, in this
embodiment the CS can receive the UR in relationship with
the service-ID it relates and also in relationship with the

corresponding addressing information from a LS, as represented by flow g2 which continues from flow g1. Accordingly, at reception of a service request in the CS (flow g3), the corresponding UR can be obtained internally

5   in said CS and checked in said CS and, then either: forward the request towards the AS (flow g4) if the check is passed, or reject the service request otherwise (flow g5).

[0089] The embodiment shown in Fig.6 illustrates schematically the routing of a service request in an

10 scenario which contains at least two communication server entities (CS1, CS2); although, as mentioned earlier, there could be more CSs (not shown) intermediating in the signaling of the service request. Fig.6 can also serve to illustrate partially the routing of a service request in an

15 scenario which contains various communication server entities (CS1, CS2) having each different roles in said routing. An example of a routing scenario comprising various CSs having each different roles is described for the IP Multimedia Subsystem IMS of a 3rd. generation mobile

20 system in the aforementioned 3GPP specification TS 23.228, which defines different roles for the CSCFs (Call State Control Functions). So, for example, Fig.6 can represent a part of the routing of a service request in the IMS relevant to illustrate the invention; wherein,

25 communication server CS1 can represent a CSCF acting as an "*Interrogating-CSCF*" (I-CSCF) and communication server CS2 can represent a CSCF acting as a "*Serving-CSCF*" (S-CSCF), while the location server depicted in the figure can represent a "Home Subscriber Server" (HSS).

30 [0090] Flows h1 and h1a are similar to previously cited flows f1 and f1a (or g1 and g1a). In the specific case of the IP Multimedia Subsystem IMS, the transfer of

information from the AS to the LS (flow h1) or to the CS2 (flow h1a), which comprises the transference of a usage rule UR, can take place according to the signaling defined in the 3GPP specification TS 29.328 (V5.2.1, Jan-2003) for 5 the so called "*Sh interface*" (interface defined between a HSS and an AS), which can be extended to regard also communications between an AS and a CSCF according to the invention; while flow h2a (which, as equivalent flow g2, continues from flow h1 as an implementation option), can 10 take place according to the signaling defined in the aforementioned 3GPP specification 29.228 for the so called "*Cx interface*" (defined between a HSS and a S-CSCF). In particular, the aforementioned 3GPP specifications TS 29.328 and TS 29.228 define a data model (referred in these 15 specifications respectively as "*Sh-Data*" and "*IMS Subscription*") that contains profile data associated to a user and which can be transferred to the S-CSCF assigned to serve said user through the *Cx interface*. Advantageously, profile data can also be (independently of the user profile 20 data of any user) associated to a given service (e.g: associated to a service-ID of said service), or even to the profile data associated to an application server entity AS (e.g.: for some or all the service-IDs of the services it hosts), and be also transferred (e.g.: via *Sh interface*) to 25 a HSS storing location information for a given service hosted in an AS, and/or transferred (e.g.: via *Sh interface* or *Cx interface*) to a S-CSCF assigned to serve signaling to/from said AS.

[0091] Accordingly, in the specific case of the IP 30 Multimedia Subsystem IMS, a usage rule UR can be for example stored in a HSS (LS) and/or in a S-CSCF (CS2), either or both: as a part of profile data related to a given user, or as a part of profile data related to a given

service (or AS), which would comprise, together with the
relevant profile data according to the data model disclosed
in the aforementioned 3GPP specifications TS 29.328 and TS
29.228, a usage rule UR according to the invention. In the
5   first case (i.e.: UR as a part of the profile data related
to a given user), the UR can be checked in the S-CSCF
assigned to serve signaling to said user when it receives a
service request from him (i.e.: checked in a CS as in the
embodiment described in Fig.5 that, for the present case,
10 could represent the S-CSCF assigned to said user on his
registration in the IMS). In the second case (i.e.: UR as a
part of the profile data related to a given service), the
UR can be checked when the S-CSCF assigned to serve
signaling to said AS receives (or is going to receive) a
15 service request for a service which is hosted in said AS;
wherein said checking can take place either: in said S-
CSCF, or in the HSS when it receives a location query with
the concerned service-ID.

[0092] Whether the usage rule UR of a given service-ID is
20 associated to the profile data of a given user and/or to
the profile data associated to a given service-ID, is an
implementation option which can be selected according to
the type of service said service-ID relates. For example,
for a service-ID which identifies a service intended to be
25 used only by a given user (such as the service-ID which
identifies a Presence service for a given watcher user), it
can be advisable to associate a UR to the user profile data
of said user; if, on the other hand, the service-ID relates
to e.g. a public messaging list, it can be advantageous to
30 define independently for said service-ID the corresponding
profile data. However, these alternatives does not preclude
that, for a given service-ID, various usage rules are
defined which are associated to the profile data of a

plurality of users, as well to a profile data independently
defined for said service-ID.

[0093] If the UR is transferred from the AS to the LS
(flow h1), the LS can, as an implementation option, further
5   transfer it to the communication server entity CS2, as it
is shown by alternative flow h2a. This, as previously cited
in reference to the embodiment illustrated in Fig.5, can
avoid further signaling between CS2 and LS by performing an
early checking of the UR in CS2.

10 [0094] As in equivalent flows of figures 4 or 5, flow h2
represents   the   arrival   of   a   service   request   to   a
communication server entity (CS1). When the service request
arrives to CS1, it sends (flow h3) a location query to the
LS which comprises the received service-ID. As in flow f3
15 in Fig.3, flow h3 (as well as further flow h5a) can also
represent the forwarding of the received service request to
a LS acting as redirect server. At this point, the LS can
check the UR which corresponds to said service-ID and,
according   to   said   check,   give   back   in   flow   h4   the
20 corresponding   addressing   information,   or   (as   described
earlier with reference to Fig.4) a negative result which
would make CS1 to answer back with a service rejection
(flow h8). In case of a successful checking of the UR, the
LS can give back an address of a further communication
25 server   entity   (CS2)   and   use   it   to   route   the   received
service request (flow h5).

[0095] In the particular case of the IMS, flow h2 can
represent the arrival of a service request to an I-CSCF
(CS1) of the network operator which governs the access to
30 the application server entity AS, and flows h3/h4 would
represent the subsequent *"Cx-Location-Query"/"Cx-Location-
Query Resp"* for obtaining addressing information usable for

routing the received request. Thus, if the check of the corresponding UR is passed, the HSS (LS) can give back an address of a S-CSCF (CS2) which can be the one assigned to serve signaling to/from the concerned application server
5   entity (AS).

[0096] Various alternative actions can take place when the service request arrives to CS2 (flow h5) depending, among other factors, on if the communication server CS2 has stored a usage rule UR which corresponds to the service-ID
10   contained in the service request it receives in flow h5 (e.g.: if flows h1a or h2a took place). For example, if CS2 has the corresponding UR, it can act as described earlier with reference to Fig.5, and either: reject back the service request (flow h7, which would continue with flow
15   h8) if the check is not passed, or further route it towards the AS (flow h6) if the check is passed. Alternatively, if CS2 does not have a UR in relationship with the received service-ID, it can, for example: further route the service request towards its destination AS (e.g.: the UR can have
20   been checked earlier) using addressing information it can have stored for the received service-ID (e.g.: from flow h2a), or send a location query to a LS (flow h5a) to obtain addressing information. In this latest case, if the corresponding UR is stored in the location server LS
25   receiving the query (which, although shown as the same as the LS receiving the location query h3, can be a different LS), it can be checked there before providing back the addressing information in response to said location query (flow h5b).

30   [0097] In the specific case of IMS, flows h5a and h5b can respectively represent server assignment request/answer operations by which, a S-CSCF that receives a service

request (CS2) containing a service-ID for which it does not have yet stored its corresponding addressing information, requests and obtains addressing information from the HSS and states that it (CS2) gets assigned to serve signaling towards the entity addressed by said addressing information. In the IMS, said server assignment request/answer operations related to services can be accomplished by operations similar to "*Cx-Put/Resp*" and "*Cx-Pull/Resp*" operations described in 3GPP specification 29.228, which would include the service-ID concerned (in the request, h5a) and the appropriate addressing information usable for routing towards the AS entitled to serve the service identified by said service-ID (in the response, h5b); wherein the usage rule UR can, either: be checked in the HSS before providing back to CS2 the addressing information for the AS, or included together with said addressing information (e.g.: if, according to the selected implementation the UR if not received previously in CS2 in flows h1a or h2a). Therefore, it should be understood that flows h2a or h1a, and flows h5a and h5b, can represent two different alternative implementation options to assign a S-CSCF (CS2) to serve signaling to the concerned AS for a service-ID, and to provide said S-CSCF with the corresponding addressing information and/or usage rule UR; wherein, in the first alternative option (flows h2a or h1a), the UR can be checked in the S-CSCF, while the second alternative option (flows h5a-h5b) allows both: to download (h5b) the UR in the S-CSCF to be further checked there, or to check the UR in the HSS (at reception of flow h5a) before providing the corresponding addressing information (flow h5b).

[0098] Before getting into the point of the routing represented by flow h2, the service request can have passed

earlier through other(s) communication server entity(ies)
CS(s) (not shown in Fig.6), so that the service request can
have been checked against the corresponding UR before route
it further (either, in an earlier CS or in an earlier LS -
5   not shown in Fig.6- which can have provided addressing
information to get CS1). For example, if the requesting
user is connected to the IMS, the service request has
passed previously through the S-CSCF which was assigned to
him during his registration in the IMS before it gets the
10   S-CSCF assigned to the concerned AS. Thus, a more complete
picture of a possible routing flow, as well as of the
possible embodiments concerning the distribution and
applicability of the UR, can be understood starting from
the signaling flows depicted in the embodiments of figures
15   4 or 5, and continuing with the signaling flow depicted in
the embodiment of Fig.6; wherein the latest flow shown in
Fig.4 (i.e.: flow f5 before getting the AS), or the latest
flow shown in Fig.5 (i.e.: flow g4 before getting the AS),
should correspond to flow h2 in Fig.6. Consequently, before
20   a service request gets the corresponding AS, it can have
been checked against the corresponding UR one or more times
as said request passes through various CSs (e.g.: when it
gets A CS assigned to serve to the requesting user, a
transit CS, a CS assigned to serve the AS, etc.), thus
25   allowing to stop undesired signaling traffic towards said
AS at different routing phases.

[0099] It shall be noticed that, for any of the
embodiments described with reference to figures 4 to 6, a
communication server (CS, CS1, CS2) can store a usage rule
30   in relationship with a service-ID independently of whether
it also stores or not the corresponding addressing
information for said service-ID; thus further unnecessary
signaling for requesting addressing information (if needed)

to a LS can be avoided if the UR is first checked at reception of a service request.

[00100] Modern server entities in a telecommunications system are commonly implemented in computer based machines. Accordingly, computer programs having computer-readable program codes are commonly loaded in a server entity (e.g.: a CS, a LS, an AS) of a telecommunications system, causing said server entity to behave according to a predefined manner which is in accordance to its specific functionality. Thus, those skilled in creating and/or modifying computer programs intended to be loaded in a computer-based server entities, would, without departing of the teachings of the present invention, apply those teachings to create and/or modify computer programs which, when executed in a computer-based communication server (CS), location server (LS) or application server (AS), would make them to behave according to any of the described embodiments.

[00101] The invention has been described in respect to some exemplary embodiments in an illustrative and non-restrictive manner. Variations can be readily apparent to those of ordinary skill in the art. For this reason, the invention is to be interpreted and limited in view of the claims.